

The Relationship between Health Literacy and Adequacy of Prenatal Care Utilization Index with Pregnancy and Postpartum Outcomes

ABSTRACT

Background and Objectives: Health literacy of pregnant mothers along with prenatal care is effective in preventing the adverse outcomes of pregnancy. We aimed to assess the relationship between health literacy, quality of prenatal care utilization index with pregnancy and adverse postpartum outcomes.

Materials and methods: The present study was a descriptive-analytical study that was done in health centers affiliated to Jundishapur University of Medical Sciences, Ahvaz, Iran. Cluster sampling is used and 20 centers were selected from 55 center randomly. The data collection tools were demographic characteristics questionnaire, maternal health literacy, pregnancy outcome questionnaire (MHLAPQ), standard Adequacy of Prenatal Care Utilization Index (APNCUI), fetal-maternal outcomes checklist, and neonatal-maternal outcomes checklist designed by the researcher. Data were analyzed at a significance level of 0.05.

Results: The health literacy score was 55.65 ± 11.53 (range: 14-70). Based on our result, 44% (176) and 64% women had adequate prenatal care and adverse pregnancy outcomes, respectively. Neonatal outcomes were seen in 49% of the participants, and 16% of the women and 64.3% of the neonates had postpartum outcomes. Health literacy was significantly associated with fetal outcomes during pregnancy ($P=0.023$) but not with maternal outcomes during pregnancy ($P=0.652$), maternal postpartum outcomes ($P=0.084$), and neonatal postpartum outcomes ($P=0.391$). The pregnancy care adequacy index had a significant relationship with maternal and fetal outcomes during pregnancy and infancy ($P<0.001$). But it had no significant relationship with maternal outcomes after delivery ($P=0.224$).

Conclusion: Promoting health literacy and receiving prenatal care in pregnant mothers requires health care providers to be aware of these indicators to design educational and care programs to promote and maintain a safe pregnancy and create a pleasant experience of pregnancy and postpartum for the mother and her family.

Paper Type: Research Article

Keywords: Health Literacy, Adequacy of prenatal care utilization index, Pregnancy Outcomes, Postpartum Outcomes.

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Introduction

Pregnancy is one of the most sensitive and important stages of a woman's life. During this period, as a healthy and normal person, a woman breeds another human being in her womb and needs more care because of the psychological changes and physical needs (1). Pregnancy care, which was confirmed as one of the strategies to achieve the third-millennium development goals in maternal health, is a systematic monitoring consisting of examination and counseling on essential pregnancy issues, education, and support of the pregnant mother and preparation of a continuous clinical and laboratory screening program to confirm low-risk pregnancy or to prevent possible complications during pregnancy (2,3). A comprehensive antenatal care program includes a coordinated, integrated approach consisting of medical care and psychosocial support, and under optimal conditions, begins before pregnancy and continues throughout the prenatal period. The ultimate goal of these services is maintaining the health of the mother and child (4).

Many deaths of mothers and their fetuses, stillbirths, premature births, and low birthweight babies are related to inadequate and unsuitable care during pregnancy, which can be greatly enhanced by providing the necessary care during this period in order to prevent future complications and problems in children (5). Adequacy of prenatal care is an important indicator in predicting infant and maternal mortality (6).

Various methods are used to evaluate the usefulness of adequate prenatal care such as the Adequacy of Prenatal Care Utilization Index (APNCUI), designed by Cattle Chuck in 1994. He Recommended one visit per month for up to 28 weeks, followed by one visit every two weeks up to 36 weeks of gestation and then a

visit every week until delivery, in the form of intensive, adequate, moderate, and inadequate care as follow:

Intensive: Prenatal care begins by the 4th month and 110% or more of recommended visits received

Adequate: Prenatal care begins by the 4th month and 80%-109% of recommended visits received

Moderate: Prenatal care begins by the 4th month and 50%-79% of recommended visits received

Inadequate: Prenatal care begins after the 4th month or less than 50% of recommended visits received (7). Receiving late care from mothers for reasons such as late knowledge of the mother about her pregnancy and start of care, which can be due to poor provision of pre-pregnancy care services and related training and lack of financial resources or Insurance coverage for these cares; Which is one of the reasons for the decrease in the adequacy of care (8).

Esfandiary(9) and khayat(10) indicate the inadequacy of receiving care. In studies conducted in Iran, we can point to factors such as the implementation of a program to reduce the number of visits (according to the new protocol in Iran) that recommends visits with longer intervals, and this reduces the number of pregnant women referring to maternity services (8, 11-12). Reduced maternal referrals to health centers and inadequate prenatal care have led to complications such as preterm delivery, low birth weight, and fetal mortality for both the mother and fetus (11,13).

Several factors has caused postpartum complications for both mother and fetus such as

low level of health literacy and awareness of pregnant women, very few educational resources and disproportionate of these resources to the women's level of understanding, a wealth of information available through the Internet and other virtual networks without controlling the

accuracy of the information, lack of attention of health care personnel to the issue of health literacy and its impact on the health of pregnant women, providing traditional and incomplete training, and lack of implementation of health literacy promotion strategies in health care centers (8, 11- 12).

The World Health Organization defines health literacy as cognitive and social skills and the individuals' ability to understand and use the information available to promote and maintain health. The medical association's population of experts has described the dimensions of health literacy as conceptual and cultural knowledge, oral literacy (speaking and listening), written literacy (writing and reading), and computational literacy (13-14). Maternal health literacy motivates and empowers women to access, understand, and use the information to maintain the health of themselves and their children (15). Health literacy in pregnant mothers consists of special knowledge and special social skills to recognize the danger signs of pregnancy, knowledge about a healthy lifestyle, and proper nutrition during pregnancy, and it ultimately affects the outcome of pregnancy by improving the quality of health care during pregnancy (10). Studies conducted in Iran indicate inadequate and borderline health literacy of pregnant mothers and recommend providing pregnancy education in a simpler language to the mothers (16-17).

Various studies have shown that health literacy affects variables related to pregnancy (18), prenatal care, and pregnancy outcome (6), reduces postpartum anemia, decreases the frequency of low birthweight infants, and increases prenatal care coverage. It also affects factors such as appropriate time to start prenatal care, frequency of care provided during pregnancy, normal birthweight, ferrous sulfate supplementation, multivitamin supplementation,

and reduction of anemia and preterm labor (19).

It was evidenced that 73% of mothers with low health literacy suffer from adverse pregnancy complications (20), receive less prenatal care, start prenatal care at a higher gestational age, deliver infants with lower birth weight and have a higher risk of neonatal admission to the intensive care unit (21), and experience postpartum depression (22). While Sajjadi stated that there was no connection between health literacy and prenatal care (23). Therefore, we aimed to assess the relationship between health literacy, prenatal care, pregnancy, and postpartum outcomes in pregnant women under the coverage of Ahwaz Health Centers.

Materials and Methods

The present study was a descriptive-analytical study done in health centers of Ahvaz, Iran. After obtaining the necessary permits and the Ethical code (IR.AJUMS.REC.1399.599) and presenting it to the health deputy officials, 20 centers were randomly selected from all health centers of Ahvaz. Considering the sample size (n=400), 20 people were selected from each center. Then, by referring to each health center, the women present in the center those who had the inclusion criteria were enrolled in the study. We included women who had passed a maximum of two months from the date of delivery, had an infant with a maximum age of two months covered by the health center, their last pregnancy was a singleton, had no history of medical and mental illness before the last pregnancy, and they were able to communicate. The sampling process was done by available sampling until the number of samples in each center was completed.

Data collection tools included a demographic information questionnaire, standard maternal health literacy and pregnancy outcome questionnaire (MHLAPQ), standard Cattle Chuck

APNCUI, fetal-maternal outcomes checklist, and neonatal-maternal outcomes checklist designed by the researcher. The MHLAPQ was developed by Mojinyinola and colleagues (2011) in Nigeria (24), and validated in Iran by Kharazi and co-workers in 2016. This questionnaire has 14 items related to maternal health literacy, scored on a 5-point Likert scale (strongly agree, agree, have no opinion, disagree, strongly disagree). To calculate the score of each subscale, the scores of each item related to that subscale are added together. The scores range from 14 to 70. The higher score shows the better maternal health literacy, and vice versa (25).

The APNCUI was developed by Cattle Chuck in 1994. This index assesses the adequacy of prenatal care based on gestational age, the month of care initiation, and the number of pregnancy visits from the first visit to the time of delivery compared to the expected number recommended by the American College of Obstetricians and Gynecologists (13). Percentage less than 50 and start in the second trimester of pregnancy indicates inadequate/forgotten care, 50-79% and start in the first trimester of pregnancy indicated moderate care adequacy, 80-109% and start in the first trimester of pregnancy indicated adequate care and percentage higher than 110 and starting in the first trimester of pregnancy indicated high adequacy or special antenatal care (5).

The validity and reliability of this index have been assessed in many studies (26-28). Regarding the checklist of fetal and maternal outcomes during pregnancy and the checklist of maternal and neonatal outcomes after childbirth, the method of scoring the outcomes in the checklist was as follows: with outcome = 1 and no outcome = 0. Interpretation of outcome was in the form of frequency distribution and expression of maximum and minimum outcome in the mother

and fetus. The scientific validity of the checklist was determined using the content validity method and calculating the content validity ratio (CVR) and content validity index (CVI). To ensure the confidentiality of information, questionnaires were provided to them anonymously. After completing the health literacy questionnaire, the part of the tool that was a checklist of indicators of adequacy of prenatal care, pregnancy outcomes, and postpartum outcomes was completed using the information in mothers' files by accessing the SIB electronic system.

The data were analyzed using SPSS software, version 25. Independent t, Mann-Whitney, and Chi-square tests, as well as ANOVA, Kruskal-Wallis test, correlation coefficient test, Linear regression analysis, and structural equation model were used as appropriated. A significance level of 0.05 was considered.

Results

In this study, the relationship between health literacy, prenatal care, pregnancy and postpartum outcomes was investigated in 400 women. We found that 65% were under 35 years old, 87% had no history of smoking and alcohol, 98% had no history of iron and multivitamin and folic acid consumption, and 94.8% had no chronic disease. 86% of the women had a pregnancy age of under 18 years, 64% had a pregnancy age of over 35 years, 11% had an unwanted pregnancy, 83% used the Cesarean delivery method, 73% of the women had been pregnant before, 90% had less than five pregnancies, 75% had two pregnancies, and 90% had negative Rh (table 1).

Health literacy rate was 55.65 ± 11.53 (range: 14-70). In total, 112 (28%) had inadequate, 112 (28%) had moderate and 176 (44%) had adequate pregnancy adequacy index scores (table 2).

Table 1: Demographic data of the participants

Variables		Number	Percentage
Mother's age	< 35	260	65
	35>	140	35
Negative Rh	Yes	40	10
	No	360	90
Fifth pregnancy and above	Yes	40	10
	No	360	90
Unwanted pregnancy	Yes	44	11
	No	356	89
History of smoking	Yes	52	13
	No	348	87
History of alcohol consumption	Yes	52	13
	No	348	87
Consumption of ferrous sulfate, multivitamin, folic acid	Yes	392	98
	No	8	2
Type of last delivery	Normal	68	17
	C-section	332	83
First pregnancy	Yes	108	27
	No	292	73
History of chronic diseases	Yes	21	5.3
	No	379	94.8
Pregnancy below 18 years of age	Yes	56	14
	No	344	86
Pregnancy over 35 years of age	Yes	144	36
	No	256	64

Table 2: Level of pregnancy care adequacy in the participants

Outcome Inadequate		Pregnancy adequacy index (frequency [%])		
		Moderate	Adequate	
Maternal outcome during pregnancy	Yes	87 (33.9)	75 (29.2)	95 (37.0)
	No	25 (17.5)	37 (25.9)	81 (56.6)
Fetal outcome during pregnancy	Yes	77 (39.3)	50 (25.5)	69 (35.2)
	No	35 (17.2)	62 (30.4)	107 (60.8)
Maternal outcome after delivery	Yes	37 (57.1)	1 (1.6)	26 (40.6)
	No	75 (22.3)	111 (33.0)	150 (44.6)
Neonatal outcome after delivery	Yes	106 (41.2)	60 (23.3)	91 (35.4)
	No	6 (4.2)	52 (36.4)	85 (59.4)
Total		112 (28.0)	112 (28.0)	176 (44.0)

The types and frequencies of maternal consequences during pregnancy were as follows: inadequate maternal weight gain during pregnancy (12%), the threat of abortion (26%), placenta previa (0.3%), premature separation of the placenta (7%), preterm delivery (41.3%), late delivery (0.3%), anemia (31%), pregnancy-induced diabetes and hypertension (11%), hyperthyroidism (5.8%), bladder and urine infections (14.3%), and genital infections during pregnancy (0.8%). In general, 64.3% of women had pregnancy outcomes.

Fetal outcomes during pregnancy also included intrauterine growth retardation (30.8%), intrauterine death (4.3%), abortion (12.8%), genetic disorders (1.3%), premature rupture of the bladder (33%), problems with the fetus in tests or ultrasound during pregnancy (7%); 49% of neonates had outcomes during the fetal period. Maternal outcomes after delivery included excessive postpartum hemorrhage (4%), Cesarean section infection (5.5%), postpartum urinary problems (1%), and postpartum depression (8.5%), and 16% of the women had postpartum outcomes.

Neonatal outcomes also included preterm infant (24%), post-term infant (4%), low birth weight 2500 g (38%), Macrosomia 4000 g (4%), history of jaundice in the first few days after birth (36%), respiratory problems at birth (11%), neonatal death (11%), history of admission to the intensive care unit (20%), and problems with breastfeeding (18%). 64.3% of the infants had postnatal outcomes. The relationship between health literacy with moderate care adequacy index using Pearson-Spearman's correlation test showed that were significant ($P < 0.001$, $r = 0.461$).

To evaluate the effect of health literacy variables, pregnancy care adequacy index, and demographic variables on the occurrence of fetal and maternal outcomes during pregnancy,

logistic regression was used, and the results showed that the variables of age ($P = 0.014$), income ($P = 0.015$), pregnancy under 18 years of age, type of last delivery, having a fifth or higher pregnancy, negative Rh and pregnancy adequacy index ($P < 0.001$) had significant effects on maternal outcome during pregnancy. There was a 2.71-fold chance of maternal outcome during pregnancy in mothers over 35 years old, a 44.31-fold chance of occurrence in mothers under 18 years old, and a 7.73-fold chance in mothers with negative Rh.

Mothers with higher incomes and a history of C/S had a lower chance of developing a miscarriage. Also, each score increase in the maternal pregnancy adequacy index reduced the chance of maternal outcome during pregnancy by 4%. Also, the results of logistic regression analysis show that the variables of maternal age ($P = 0.041$), pregnancy under 18 years ($P = 0.009$), fifth and higher pregnancies ($P = 0.010$), negative Rh ($P < 0.001$), health literacy ($P = 0.023$), and pregnancy adequacy index ($P < 0.001$) had an effect on fetal outcome during pregnancy.

The chance of developing fetal outcomes during pregnancy was two times higher in mothers over 35 years old, 3.68 times higher in mothers under 18 years old, four times higher in mothers with less than five pregnancies, and 5.82 times higher in mothers with negative Rh. A unit increase in maternal health literacy and a unit increase in maternal pregnancy adequacy index reduced the chance of developing fetal outcomes during pregnancy by 3% and 2%, respectively (table 3). To evaluate the effect of health literacy variables, pregnancy care adequacy index and demographic variables on the chance of neonatal and maternal outcomes after delivery, the results showed that education variables ($P = 0.005$), number of pregnancies ($P = 0.026$), negative Rh ($P < 0.001$), and unwanted

pregnancy ($P=0.007$) had an effect on maternal outcome after delivery.

The chance of having a maternal outcome after childbirth was 6.88 times more in mothers with negative Rh, 4.21 times more in mothers with unwanted pregnancies, and less in mothers with two pregnancies and mothers with a high school diploma. Regarding postnatal neonatal outcomes, the results of logistic regression analysis showed that career variables ($P=0.006$), number of pregnancies ($P=0.037$), pregnancy over 35 years, negative Rh, and pregnancy adequacy

index ($P<0.001$) had an effect on postpartum neonatal outcome. The chance of neonatal outcome was approximately 30 times higher in mothers over 35 years of age, 7.74 times higher in housewives than in working mothers, 2.1 times higher in mothers with negative Rh, and lower in mothers with two pregnancies than mothers with pregnancies less than 2. A unit increase in maternal pregnancy adequacy index reduced the chances of having a neonatal outcome by 6% (table 4).

Table 4: Assessing the effect of different variables on maternal and neonatal outcomes after delivery

Maternal outcomes after delivery	B	SE	P value	Odds ratio (OR)	Confidence interval for odds ratio (OR)	
					Lower limit	Upper limit
Education (Diploma, Reference: Under Diploma)	-1.97	0.69	0.005	0.14	0.04	0.54
Number of pregnancies (reference: less than or equal to 2)	-1.30	0.58	0.026	0.27	0.09	0.86
Unwanted pregnancy	1.44	0.54	0.007	4.21	1.47	12.03
Negative Rh	1.93	0.55	<0.001	6.88	2.34	20.19
Neonatal outcomes after delivery	B	SE	P value	Odds ratio (OR)	Confidence interval for odds ratio (OR)	
					Lower limit	Upper limit
Occupation (Reference: Housewife)	2.05	0.75	0.006	7.74	1.79	33.39
Pregnancy over 35 years	3.38	1.06	0.001	29.59	3.66	79.11
Negative Rh	0.69	0.68	<0.001	2.01	0.52	7.68
Number of pregnancies (reference: less than equal to 2)	-1.14	0.55	0.037	0.32	0.11	0.93
Pregnancy adequacy index	-0.06	0.01	<0.001	0.94	0.92	0.96

Discussion

The aim of this study was to evaluate the relationship between health literacy and prenatal care with pregnancy and postpartum outcomes in pregnant women. The findings of this study showed that the health literacy score was 55.65 ± 11.53 (range: 14-70). Izadirad(2018) stated the level of health literacy was insufficient and

borderline (8). It seems that the reason for the low level of health literacy in pregnant women is related to their low level of awareness, very few educational resources, and their unsuitability with the level of the patients' understanding, a wealth of information available through the Internet and other virtual networks that

control the accuracy of the information, lack of attention of the health care personnel to the issue of health literacy and its impact on the health of pregnant women, traditional and incomplete training and education, and lack of implementation of health literacy promotion strategies in health care centers (8,11).

In our study, 44% (176 people) had an adequate pregnancy adequacy index, which is consistent with another study (11). Izadirad and colleagues also reported a pregnancy adequacy index of 33%, which was inadequate (8). To evaluate the effect of variables on the chance of maternal outcomes during pregnancy, the variables of age, income, pregnancy under 18 years, type of last delivery, having a fifth or higher pregnancy, negative Rh, and pregnancy adequacy index had an effect on maternal outcome during pregnancy.

The chances of maternal outcome during pregnancy in mothers over 35 years, mothers under 18 years, and mothers with negative Rh were 2.71, 44.31, and 7.73 times higher, respectively. The chances of a miscarriage were lower in mothers with higher income and those whose previous delivery was through Cesarean section. Also, a unit increase in the maternal pregnancy adequacy index during pregnancy reduced the chance of maternal outcome during pregnancy by 4%. Sharemi et al(2013) showed a significant relationship between pre-eclampsia and negative Rh. After chronic hypertension, negative Rh and a history of miscarriage in pregnant women increased the risk of mild pre-eclampsia during pregnancy, respectively (28).

Regarding the effect of variables on the chance of fetal outcome during pregnancy, maternal age, pregnancy under 18 years, fifth pregnancy and above, negative Rh, health literacy, and pregnancy adequacy index had an effect on fetal outcome during pregnancy. The chance of developing fetal outcomes during pregnancy was two times

higher in mothers over 35 years old, 3.68 times higher in mothers under 18 years old, four times higher in mothers with less than five pregnancies, and 5.82 times higher in mothers with negative Rh. A 3% increase in health literacy and a 2% increase in pregnancy adequacy index reduced the chance of fetal outcome during pregnancy. In this regard, Williams and colleagues stated that starting prenatal care as soon as possible after the first delay in the menstrual cycle is effective in reducing fetal complications during pregnancy (29). Several factors affect maternal outcomes such as health literacy skills, pregnancy care adequacy index, and demographic variables on the chance of maternal outcomes, education variables, number of pregnancies, negative Rh, and unwanted pregnancy. The chances of having a maternal outcome after childbirth were 6.88 times higher in mothers with negative Rh, 4.21 times higher in mothers with unwanted pregnancies, and lower in mothers with two pregnancies and mothers with a high school diploma. Regarding the effect of variables on the chance of neonatal outcomes, the variables of job, the number of pregnancies, pregnancies over 35 years, negative Rh, and maternal pregnancy adequacy index had an effect on the incidence of neonatal outcomes.

The chance of neonatal outcome was approximately 30 times higher in mothers over 35 years of age, 7.74 times higher in housewives than in working mothers, 2.1 times higher in mothers with negative Rh, and lower in mothers with two pregnancies than mothers with pregnancies less than 2. A unit increase in the adequacy index of prenatal care during pregnancy reduced the chances of having a postpartum outcome in infants by 6%. In line with the present study, another study showed a significant relationship between health literacy and postpartum pregnancy outcome ($R=0.633$,

$P < 0.001$) (30). Izadirad and colleagues found that the prevalence of low birth weight was 5.16%, so the pregnancy care adequacy index was the strongest predictor (47%) of birth weight (8). Other researchers found a significant relationship between maternal health literacy and the number of pregnancies, time of onset of care, frequency of care provided during pregnancy, birth weight, supplementation, and anemia ($P < 0.05$) (19). In another study, the index of receiving prenatal care was 84.4% (adequate). Inadequate prenatal care was also associated with an increased chance of preterm delivery, low birth weight, and admission to the intensive care unit (31). Moreover, women with lower education had infants with slower embryonic development and consequently lower birth weight (32). The probability of preterm delivery in mothers with inadequate care was 1.36 times higher than mothers receiving adequate and intensive care ($P < 0.05$). Also, a unit increase in the pregnancy adequacy index reduced the chance of neonatal outcomes by 6% (33). The limitation of the study was the frequent visits to health centers to complete the sample size in each center.

Conclusion: Women's health literacy has been moderate. Half of the women had adequate pregnancy, adequacy index, and received prenatal care according to age and pregnancy conditions. Regarding the consequences during pregnancy, the most consequences were for mothers who gave birth prematurely and for the fetus, premature rupture of the bladder. The highest maternal outcome was postpartum depression for mothers and low birth weight infants. Women who had a moderate pregnancy adequacy index and received moderate prenatal care had fewer outcomes during pregnancy and after delivery. Our findings highlighted that promoting health liter-

acy and receiving prenatal care in pregnant mothers requires health care providers to be aware of these indicators to promote and maintain a safe pregnancy and create a pleasant experience during pregnancy and postpartum for the mother and her family. In this regard, continuous training of health center staff is necessary. On the other hand, there is a need to pay more attention to receiving timely care. It is necessary to take steps in teaching prenatal care and promoting the health literacy of pregnant mothers. Therefore, by designing educational care programs, pregnant women would be encouraged to participate in programs for receiving timely pregnancy care and health literacy training.

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